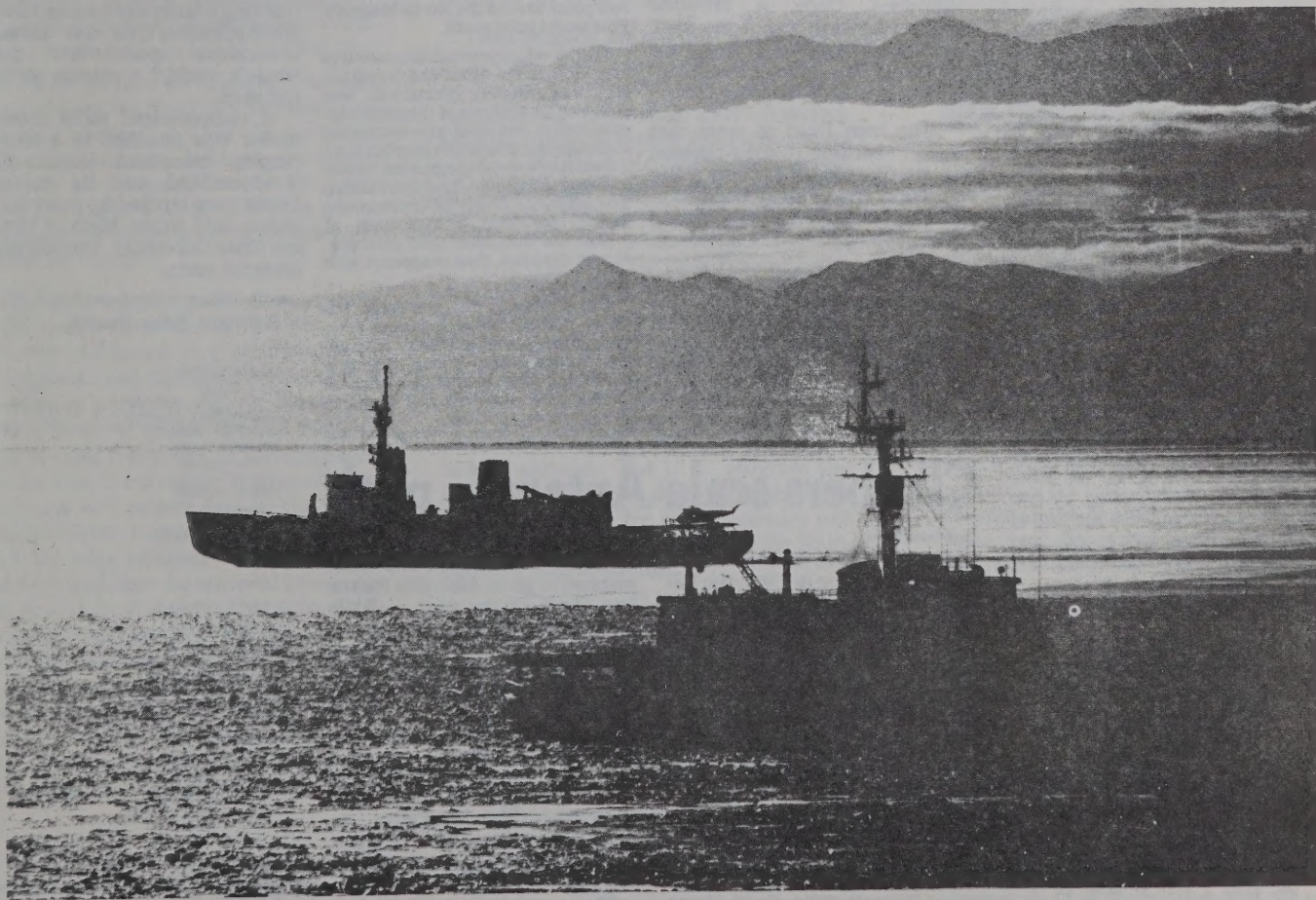


THE POLAR TIMES



NSF photo by Russ Kinne.

Two Coast Guard icebreakers, the *Polar Sea* (left) and the *Glacier* (right), pass each other in McMurdo Sound near McMurdo Station

Antarctic Journal

Expedition expediting advances

Associated Press

Tucson, Ariz. — Russell Robinson remembers Adm. Richard E. Byrd's second Antarctic expedition 50 years ago as "extremely primitive" compared with those of today.

Robinson, then 22, was one of 100 men hired for the two-year trek that broke new ground in scientific exploration of the ice-bound continent.

He and other members of the expedition gathered in Washington in October to celebrate the anniversary of that day five decades ago when the Jacob Rupert, one of two ships used to transport the crew, set sail from Boston to New Zealand.

An aeronautical engineer, Robinson was assigned to look after the expedition's airplanes. But he spent most of his time behind dog sleds — the only means of transportation used to move supplies to and from the expedition camps.

"Today the expeditions are all done with motorized equipment — not a dog in the contingent, as far as I know. We depended on dogs very much," Robinson, now living in Tucson in retirement, recalled.

The dog teams traveled routes made treacherous by the shifts and buckles in the icy terrain, he explained. "We used to put marking flags in the ice and watch them move over time," he said. The motion was created by two bodies of ice that were moving at different rates of speed and grinding against each other.

The Polar Times

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AUGUST HOWARD, Editor

THE POLAR TIMES highly recommends "The Polar Record," published by the Scott Polar Research Institute, Cambridge, England.

The American Polar Society was founded Nov. 29, 1934, to band together all persons interested in polar exploration. Membership dues are \$2.00 a year or \$5.00 for 3 years, which entitles members to receive THE POLAR TIMES twice a year.

The American Polar Society is classified as a tax exempt organization under Code Section 509 (a) (2).

Navy to Assist Study Of Antarctica Volcano

MARIETTA, Ga. — A specially instrumented Lockheed LC-130 ski Hercules propjet, belonging to the Navy, will fly into the "eye" of Antarctica's Mount Erebus in early December, seeking to unravel the how's and why's of the volcano.

The flights will be part of a National Science Foundation research project, according to Dr. Raymond Chuan, a member of the scientific team.

Mount Erebus, reaching up more than 13,000 feet, is located on Antarctica's Ross Island near McMurdo Sound. It is an active volcano that spews steam and smoke. The volcano's active crater measures about a half a mile wide and 900 feet deep.

"Mount Erebus is active all the time," Dr. Chuan said. "We'll fly right into the plume, gathering samples of the air and measuring its sulphur dioxide content."

The flights will be carried out for the foundation by the Navy's Antarctic Development Squadron 6, Point Mugu, Calif. The unit's ski-birds are on the continent and will remain there until the end of the polar "austral summer" next February. The propjets will airlift supplies, fuel and personnel to and from various stations and also fly scientific missions.

"You'd get all kinds of trail accidents," Robinson said — dogs and men injured from sled collisions. Once, a crevasse opened beneath one of the men, who would have slid to an icy death in the water if onlookers hadn't managed to rescue him.

The men lived in tents that soon became snow-covered caves. They spent 12 hours a day at work, and 12 hours huddled in down-filled sleeping bags, resting and sleeping.

Magnetic Field Weakening

The magnetic field of the earth has apparently weakened by more than 50 percent in the last 4,000 years, possibly indicating that a reversal of the

magnetic poles is under way, according to a report by two scientists at the University of Minnesota. If such a reversal occurs, compass needles that now point toward the North Magnetic Pole would point south.

The report, presented this month to a meeting of the American Geophysical Union in San Francisco, was based on an analysis of magnetic orientations in sediment at a succession of depths in a Minnesota lake bottom.

Past analyses of magnetism frozen into successive lava flows have shown that magnetic reversals occur over a period measured in thousands of years. The magnetic field weakens, almost vanishes, then reappears with opposite polarity.

The Minnesota analysis points out that a number of bacteria, birds, insects and fish use the earth's magnetism for guidance. It has been proposed that some extinctions occurred during past reversals and that this

could happen again.

The authors of the report were Dr. Subir K. Banerjee, a professor of geophysics, and Donald Sprowl, a graduate student.

High-Rise Mollusks

It is not unique to man to live one on top of another, high-rise fashion. The limpet, *Nacella (Patinigera) concinna*, a mollusk that frequents rocky Antarctic shores, has been found, during spawning, to form just such vertical stacks of up to eight individuals, each animal perched on the shell of the one below. The limpet uses this stacking process possibly to increase the likelihood of successful fertilization and to keep the larvae in the preferred coastal environment, according to G. B. Picken of the University of Aberdeen's Department of Zoology and D. Allan of the British Antarctic Survey, writing in the Oct. 6 issue of the British journal *Nature*.

Satellite tracks whale

Associated Press

Newport, Ore. — Satellites tracking a humpback whale have given scientists their first "three-dimensional peek into the whale's world," a marine biologist says.

A computerized radio transmitter was attached to a free-ranging humpback whale off Newfoundland and its movements were tracked by polar satellites, said Bruce Mate of Oregon State University, who led the research team.

American Polar Society

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Climbers scale Antarctic peak

Associated Press

Seattle — Two American businessmen seeking to climb the tallest mountain on each of the world's seven continents in one year reached the summit of Mt. Vinson Massif in Antarctica on Nov. 30, Dan McConnell, expedition spokesman, reported Sunday.

The 16,864-foot Massif is the sixth of the seven mountains to be climbed.

McConnell said he received word via radio-telephone from the team of Dick Bass, 53, of Dallas, Texas, and Frank Wells, 51, of Beverly Hills, Calif., from "Sypl" station on an island between Antarctica and Chile.

The climb was accomplished in extremely high winds and sub-

zero temperatures.

He said the Bass-Wells team planned to go to Australia for the last climb of the year — 7,310-foot Mt. Kosciuszko — as soon as weather permits. Kosciuszko — with a road to the summit — promises to be the easiest of the peaks.

In addition to Mt. Vinson Massif, summits already reached, McConnell said, were 22,831-foot Mt. Aconcagua in Argentina, 20,320-foot Mt. McKinley in Alaska, 19,340-foot Mt. Kilimanjaro, and 18,510-foot Mt. Elbrus in Russia.

Their expedition to 29,028-foot Mt. Everest last spring placed six Americans and two sherpas on the summit. Bass reached 28,000 feet and Wells 28,200 feet.

The Polar Times

No. 97

DECEMBER 1983

West antarctic ice sheet and marine ecosystems investigations highlight 1983-1984 U. S. program

Antarctic Journal

The west antarctic ice sheet covers more than 2.6 million square kilometers of the continent; a large part of it is grounded well below sea level. It is the world's only marine-based ice sheet and is subject to relatively rapid changes. The east antarctic and Greenland ice sheets, the only other major ice sheets, are land-based and respond slowly to change. Information on the history and nature of the west antarctic ice sheet is limited, but during the 1983-1984 austral summer four teams of U.S. scientists will study its stability, behavior during the last glaciation and interglacial period, and response to climate changes. Working on the Siple Coast (82°S 155°W), they will focus on four ice streams that flow into the Ross Ice Shelf. Ice streams, fast-flowing "glaciers" within the ice sheet, play an important role in the ice sheet's response to change. These projects will expand scientific understanding of ice sheets and the response of the polar regions to climate changes.

While glaciologists probe the dynamics of the west antarctic ice sheet, other scientists will collaborate in a marine biological, physical, and chemical investigation of ice-edge ecosystems during November 1983. Working aboard the R/V *Melville* from Scripps Institution of Oceanography and the USCG icebreaker *Westwind*, these scientists will collect data in the South Atlantic Ocean that may suggest why the pack-ice edge enhances biological productivity and how the seasonal ice margin acts as ecological interface between open-ocean and pack-ice communities. Physical and biological processes are interrelated near the ice edge; a collaborative investigation will enable the scientists to learn about the relationships among oceanic features, the fluctuating sea ice cover, and the marine life that inhabits these areas.

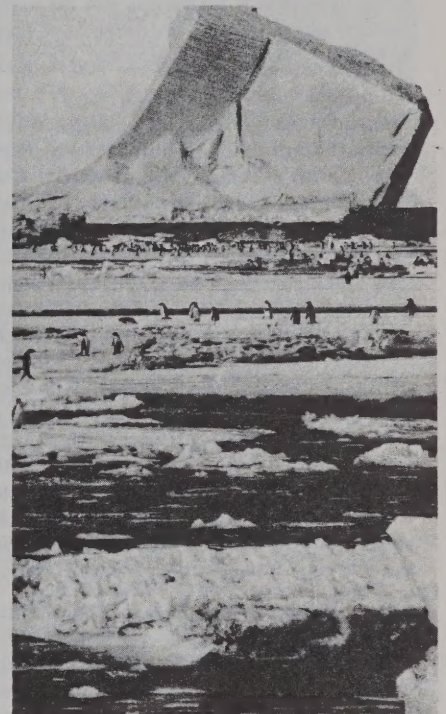
Later in the summer, a second group of biologists and physical oceanographers will use the *Melville* to study the behavior and biology of krill superswarms near the Antarctic Peninsula. Although the antarctic pelagic ecosystem is dominated by krill, many aspects of this crustacean's biology

and ecology are still poorly understood. Superswarms have been recorded to contain up to 10 million metric tons of adult krill with a population density of over 5,000 animals per cubic meter. These swarms attract not only such natural predators as baleen whales but also commercial fishing expeditions. During their investigation the scientists will describe a superswarm, its spatial and temporal behavior, and relationship with the environment. Data from investigations like this one may improve the understanding of ecological relationships in the southern ocean.

These projects are part of the 1983-1984 U.S. Antarctic Research Program (USARP), a program that the United States has continuously operated since 1957. Research on the continent and in the surrounding oceans provides data crucial to understanding such global processes as climate variability, plate tectonics, and solar-terrestrial physics as well as fundamental knowledge of Antarctica. The National Science Foundation, which funds and manages the U.S. program, supports research in glaciology, earth sciences, ocean sciences, marine and terrestrial biology, medical sciences, and atmospheric sciences. The scientists who conduct these investigations are from universities, nonprofit institutions, and some federal agencies. The U. S. program also includes occasional short-term scientific activities funded by other agencies and coordinated in the framework of the Foundation's logistic system.

During this austral summer, the National Science Foundation will support over 300 researchers conducting 93 projects. Land-based research will be conducted at McMurdo, Amundsen-Scott South Pole, Siple, and Palmer Stations (the four U.S. stations), remote sites, or stations of other nations. Marine research will be carried out aboard the R/V *Melville*, the Foundation's research ship *Hero*, and the two U. S. Coast Guard icebreakers *Polar Sea* and *Westwind*.

In other projects, geologists supported by the *Westwind* will return to the James Ross Island area near the eastern coast of the Antarctic Peninsula to search for plant and animal fossils, which help explain Ant-



NSF photo by William Curtsinger.

Adélie penguins gather on the sea ice under the shadow of a large iceberg. A truly antarctic bird, Adélie penguin and its colonies are found within 1,400 kilometers of the South Pole and rarely found north of the antarctic circle.

arctica's past relationship with South America. Seymour Island, one of the islands in this group, was the site of the first discovery (in 1982) of antarctic land mammal fossils. A glacial geology project will search for marine microfossils at elevations well above sea level along a 1,600-kilometer stretch of the Transantarctic Mountains. Scientists believe that the fossils will help determine the size and frequency of antarctic ice sheet fluctuations that occurred over 65 million years ago. In both these projects fossils provide a key for understanding past environmental changes, ice sheet movement, and the geologic history of the continent.

Marine geologists working aboard the *Melville* and the South African research ship *Agulhas* will study variations in the geochemistry of the Earth's upper mantle. This research, which has been conducted by U. S. and South African scientists for several years, is designed to locate upper mantle hot spots thought by many scientists to be the driving mechanism for tectonic plate motion. Both groups will

work near the Southwest Indian Ridge. This undersea feature is part of the global midoceanic ridge and separates the African tectonic plate from the antarctic plate. Rock samples dredged from locations along the ridge will be used to describe variations in geochemistry and help define where active upwelling is taking place in the mantle. One objective is to determine how such upwelling might cause tectonic plates to move.

Investigations of the sun's internal structure will continue at South Pole Station this austral summer, along with a new astronomy project. Astronomers will test an 8-centimeter telescope system to monitor photoelectrically four discrete stars at several wavelengths during the austral winter. These tests will help investigators evaluate the South Pole site for future research as well as provide new data on the selected stars about which little is known. The telescope will be set up during the summer; a microcomputer will activate it for observations between April and September 1984 when the sky is dark. The South Pole site was chosen not only because the austral winter is long and dark but also because the star elevations do not vary diurnally.

Cooperative research with other nations is an important component of the U.S. program. This austral summer U. S. scientists will work with scientists from Australia, Chile, China, France, the Federal Republic of Germany, Japan, New Zealand, Poland, South Africa, the Soviet Union, Switzerland, and the United Kingdom in more than 20 projects. U. S. scientists will work in company with field programs of other nations, while foreign scientists will work at U. S. stations or in remote areas of Antarctica with U.S. scientists.

Navy, Coast Guard, contract, and other personnel support USARP

To ensure that U. S. scientists are able to conduct research successfully and safely, an efficient support system is a necessary component of the U. S. Antarctic Research Program. Annually about 1,000 people work on the continent as a part of this support system; another 400 people work aboard the Navy supply ships and Coast Guard icebreakers. Military personnel are members of the U. S. Naval Support Force Antarctica (NSFA), Antarctic Development Squadron Six (VXE-6), the U. S. Coast Guard, and other Navy or military units. Others are employees of a contractor, ITT/Antarctic Services, Inc. (ITT/ANS). The Navy personnel fly airplanes and helicopters, oversee the operation of the supply ships, provide health care, long-range communications at McMurdo Sta-

tion, weather forecasting services, and perform some maintenance work at McMurdo Station; Coast Guard personnel operate the icebreakers. The contractor's employees provide support at McMurdo Station and operate Williams Field (McMurdo Station's skiway airfield on the ice-shelf), Amundsen-Scott South Pole, Siple, and Palmer Stations, R/V *Hero*, and remote field camps.

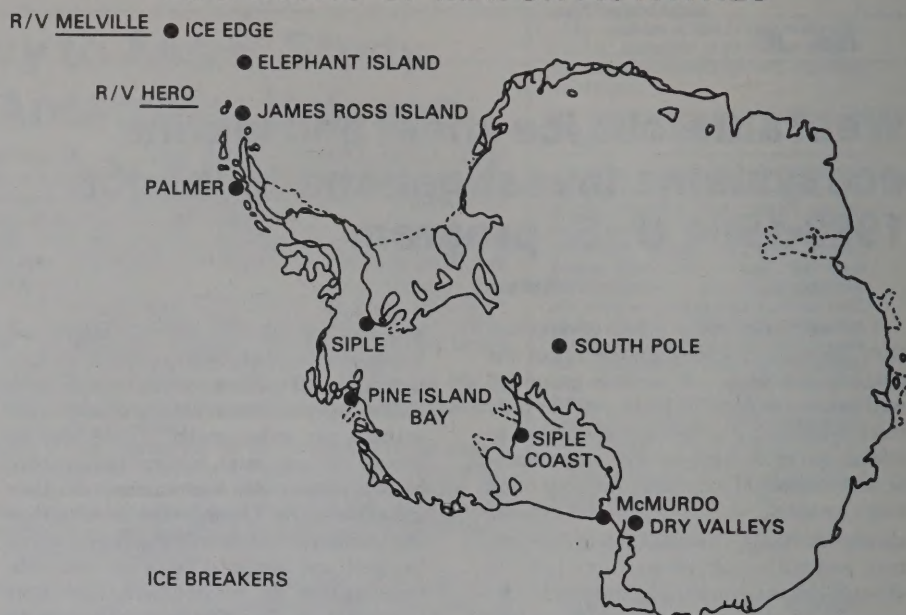
During 1983-1984, the 29th consecutive year of U. S. activity in Antarctica, ship-based research will be a significant part of the program. Two Coast Guard icebreakers, the *Polar Sea* and the *Westwind*, will operate in the southern oceans. The *Polar Sea* will resupply Palmer Station in December and then go to McMurdo Station to open a channel in McMurdo Sound sea ice for the annual supply ship the USNS *Southern Cross* and the tanker USNS *Maumee*. After the channel break-in the ship will support several science projects in the Ross Sea before beginning a cruise along the Marie Byrd Land and Ellsworth Land coasts. This cruise will enable geologists to investigate Mt. Siple on Siple Island, Pine Island Bay, Thurston Island, and other remote areas.

The *Polar Sea* also will make a final stop at Palmer Station before returning to its home port, Seattle, Washington.

The *Westwind's* cruises will be devoted to the Antarctic Peninsula area and Weddell Sea. In November this icebreaker will support scientists and assist the R/V *Melville* along the ice edge of the Weddell Sea during an investigation of the marine ecosystem. In December the *Westwind* will support geologists in the James Ross Island area.

U.S. ANTARCTIC RESEARCH PROGRAM 1983-1984

LOCATIONS OF MAJOR ACTIVITIES



The *Melville*, operated by Scripps Institution of Oceanography and a part of the University-National Oceanographic Laboratory System (UNOLS), will be one of two UNOLS ships working near Antarctica this austral summer. In addition to the marine ecosystems cruise it will support two other cruises. From early January to mid-February 1984 the ship will support marine geophysics research along the southern portion of the Southwest Indian Ocean Ridge. The last cruise in February and March is devoted to an investigation of krill swarms in the South Georgia Island-Scotia Sea area. The second UNOLS ship, the R/V *Knorr*, will support an oceanographic survey near the zero (Greenwich) meridian in the southern oceans during January 1984.

Beginning in November 1983 and ending in April 1984, the National Science Foundation's research ship *Hero* will operate between Punta Arenas, Chile, and Palmer Station, Anvers Island. During two cruises the ship will support marine biology programs along the Antarctic Peninsula. During the first cruise *Hero* also will bring support and science personnel to Palmer Station; at the end of the second cruise *Hero* will pick up summer personnel from the station and return them to South America.

Sponsored by the U. S. Geological Survey, the R/V *S.P. Lee* will do seismic surveying and sampling in antarctic waters between December 1983 and March 1984. During the first 30-day leg the ship will work along Wilkes Land in East Antarctica. After refueling at McMurdo Station in early February the *Lee* will begin the second 30-day leg in the Ross Sea to complete the survey.

U.N. Urges a Study of Antarctica

By **RICHARD BERNSTEIN**

The New York Times

UNITED NATIONS, N.Y., Nov. 30 — A resolution calling for a study of "all aspects of Antarctica" was adopted in the United Nations today.

The measure was the result of a month of bargaining between the nations that profess nonalignment on the one hand and, on the other, an unusual alliance of countries, including the United States and the Soviet Union, that rarely agree on anything.

The resolution, the first adopted on Antarctica in the 38-year history of the United Nations, "requests the Secretary General to prepare a comprehensive, factual and objective study" of the world's southernmost land mass.

The issue of Antarctica was raised here by Malaysia with the support of many of the third world countries, the largest voting bloc in the world organization. The Malaysians argued that

Antarctica was controlled by a small group of nations operating to the exclusion of the world as a whole.

Members of the Antarctica Treaty System, a total of 16 countries that do scientific work or have territorial claims on Antarctica, contended that present treaties are working well to safeguard the continent's nonmilitarized status and its environment.

Exploration and settlement in Antarctica have been regulated since 1959 by a treaty banning military use of the area and prohibiting further territorial claims. An agreement in 1964 provides for environmental protection.

The resolution calling for a complete study was a compromise formula adopted after long and intense negotiation. It was adopted in the disarmament committee of the General Assembly this afternoon without a vote.

USGS symposium celebrates triple polar anniversary

The U.S. Geological Survey (USGS) will sponsor a public symposium to celebrate the 100th and 50th anniversaries of the First and Second Polar Years and the 25th anniversary of the International Geophysical Year. Organized at the urging of the International Council of Scientific Unions and the Geophysical Research Board of the National Academy of Sciences, the symposium will be held from 12 to 14 October 1983 at the National Academy of Sciences in Washington, D.C.

The program will focus on research by USGS scientists in the Arctic and Antarctic. Topics to be discussed include energy and mineral resources, geology, geophysics, glaciology, and cartography. USGS has solicited papers from scientists who are or have been employed by the agency.

What is Antarctica like?

Antarctica, larger than the United States and Mexico combined, has an area of 5.5 million square miles. Ninety-eight percent of it is covered by ice with an average thickness of over a mile. At its thickest, the ice is 3 miles deep; it has a volume of 7.2 million cubic miles.

Crossing the continent, the Transantarctic Mountains divide the ice sheet into two parts. The larger, eastern ice sheet has been there at least 14 million years and rests on land that is mostly above sea level. The smaller, western ice sheet probably is younger than the eastern one and is on land that is mostly below sea level. The Ellsworth Mountains at the base of the Antarctic Peninsula are the continent's tallest; one of these, the Vinson Massif, is 16,066 feet above sea level.

Antarctica is the coldest continent. The world's lowest temperature, minus 126.9°F. was recorded at the Soviet Union's station Vostok, 870 miles inland. The lowest tem-

perature at the geographic South Pole was minus 117.4°F., recorded at the U. S. station there. The average coldest-month temperature in the interior is minus 94°F. Excluding the Antarctic Peninsula, where the climate is relatively mild, the highest known temperature is 48°F., recorded at Australia's Casey Station.

Much of Antarctica is a desert. Annual precipitation at the South Pole is less than 3 inches (water equivalent), making it one of the world's major deserts. Yet antarctic ice and snow, the results of accumulation over millions of years, comprise 70 percent of the world's fresh water.

Land life is limited to bacteria, lichens, mosses, and insects in ice-free areas (2 percent of the continent), while penguins and flying birds occupy summer rookeries on the coasts. Antarctica's marine life is abundant, consisting mainly of plankton, krill, fishes, birds, seals, and whales.

People's Republic of China accedes to Antarctic Treaty

On 8 June 1983 the People's Republic of China joined with 26 other nations that recognize the Antarctic Treaty, when it acceded to the Treaty. The other acceding nations are Brazil, Bulgaria, Czechoslovakia, Denmark, the German Democratic Republic, Italy, the Netherlands, Papua New Guinea, Peru, Romania, Spain, and Uruguay. These acceding nations agree to abide by the Treaty, but do not participate in its operation.

The contracting nations, or consultative parties, all of which were original treaty

signatories or have substantial programs in Antarctica, are Argentina, Australia, Belgium, Chile, the Federal Republic of Germany, France, Japan, New Zealand, Norway, Poland, the Republic of South Africa, the Union of Soviet Socialist Republics, the United Kingdom, and the United States. Representatives of these nations participate in periodic consultative meetings to formulate recommendations aimed at furthering objectives of the Treaty. The 12th meeting of the Antarctic Treaty Consultative Parties was held 13 to 23 September 1983 in Canberra, Australia.

Whaling Meeting Ends

BRIGHTON, England, July 23 (UPI) — The International Whaling Commission ended its annual meeting today with an unexpected agreement by Peru to phase out commercial whaling by 1986.

The 40-nation commission voted last year to ban all commercial whaling by 1986. It meets annually to fix whaling quotas.

Japan, the Soviet Union and Norway were again pressured to accept the whaling ban. The three, in addition to Peru, filed formal objections to the ban this year, in effect allowing them to ignore it since the whaling commission has no powers of enforcement.

But after negotiations this week, Peru changed its mind and said it was withdrawing its objection. This brought a strong public protest from Japan, which imports all of Peru's whale catch.

Antiwhaling nations frustrated attempts by Japan and Norway to seek higher catch limits on Minke whales in the Antarctic Ocean. But whaling nations that have agreed to phase out commercial whaling — Peru, Brazil, South Korea and Iceland — suddenly won concessions to kill more whales until the worldwide ban takes effect.

Peru, for example, will be allowed to catch 165 Bryde's whales in 1983-84 and a reduced number the next season.

The United States, which supports the whaling ban, found itself in the position of pushing for higher catches of Bowhead whales by Alaska's Eskimos. However, after five and a half hours of backroom wrangling early today, it finally accepted a two-year limit of 43 whales.

The United States has threatened to impose economic sanctions and ban fish imports from Japan, the Soviet Union and Norway if they do not conform to the whaling ban by 1986.

Using fossils to learn about Antarctica

By Mona Megalli

United Press International

The National Science Foundation reports that extinct marine organisms discovered atop Antarctic mountains indicate oceans inundated the continent 3 million years ago.

The recent findings by Ohio State University researchers may change many concepts about the glacial history of the continent, said Peter Webb, the OSU paleontologist who extracted the ancient marine life fossils from samples of glacial deposits collected by Dr. John Mercer.

Webb said scientists believe the South Polar ice cap is about 20 million years old.

"The ice cap is not just a great stagnant mass of ice," Webb said. "It has come and gone many times. The last time the sea was in there was about 3 million years ago. Then, we got the present ice cap and the sea was driven out for the last time."

He said for more than 70 million years the East Antarctic ice sheet, now more than 10,000 feet deep, periodically built up and expanded, overlapping major mountain chains, and pushed out into the Southern Atlantic,

Pacific and Indian oceans surrounding the continent. When the ice receded shallow continental seas invaded and flooded low areas.

"You could lose the Mediterranean Sea several times over in these seas, which could extend over two-thirds of the way across the United States," he said.

The microfossils found between 7,000 feet and 9,000 feet above sea level on the Transantarctic Mountain Range lived in these relatively warm oceans hundreds of miles away and were picked up as fossils 2 million years ago by the sheet as it re-expanded and buried the oceans.

Webb said the mountains would have had to grow at incredible speed to lift ocean bed fossils to 9,000 feet, and discounted that possibility.

Webb said the ice squeezed the deposits out at the edges of the ice sheet and up the mountains like toothpaste out of a tube. "You don't have to drill holes in the ice cap," he said. "You can go around the edges and do quite a lot of detective work with the debris that has been brought out."

Webb said the findings will help

decipher world climate in the past 65 million years and explain global fluctuations of sea levels during that time.

He said scientists will also be able to map the distribution of major sedimentary basins and former seaways that apparently crossed Antarctica at various times in the past 60 million years.

These seaways acted like "short circuits" and connected the Southern Atlantic, Pacific and Indian oceans providing important marine migration routes. //

Flotilla of Japanese Whalers Leaves on Antarctic Voyage

TOKYO, Oct. 22 — Japan's only remaining whaling mother ship left Yokosuka near Tokyo today en route to the Antarctic Ocean, maritime officials said.

The 26,000-ton No. 3 Nisshin Maru, with 279 crewmen aboard and four catcher ships at its side, is expected to harvest its quota of 3,027 whales in the Antarctic Ocean between mid-November and early March 1984, the officials said.

Panel votes funds for whale research

News-Miner Bureau

WASHINGTON—A Senate appropriations subcommittee today approved legislation which includes \$600,000 for the National Oceanic and Atmospheric Administration to conduct research on bowhead whales in fiscal year 1984.

The bill also allocates \$50,000 to the Alaska Eskimo Whaling Commission for bowhead management and research.

The funding was added by Sen. Ted Stevens, R-Alaska, a member of the panel.

Stevens also inserted language in the bill to direct the federal government to keep open the National Marine Fisheries Service laboratories at Kodiak and Auke Bay. The service wants to close the facilities in a budget-cutting move.

The appropriations bill includes \$275,000 to renovate a Federal Communications Commission monitoring station in Anchorage. Stevens said the facility is the state's sole means of monitoring and maintaining radio transmissions in Alaska and is essential in locating lost aircraft and ships throughout the north Pacific.

The measure now goes to the full Appropriations Committee for action. The 1984 fiscal year starts Oct. 1, 1983.

Home sweet home may be in Antarctica

SANTIAGO, Chile (AP)—This South American country, which has claims to nearly 500,000 square miles of Antarctica, plans to colonize that frozen continent with "ordinary families," including small children, next year.

"We don't know of any other nation that is doing this," said Air Force Col. Hernan Huidobro, the coordinator of the program. "The purpose is to concretely demonstrate Chile's presence in Antarctica and show that our interests there are physical—not just words on some documents."

Six volunteers—two Air Force pilots and four civilians—are to take their wives and children to Chile's Lt. Marsh Antarctic base in February. Unlike Chilean military personnel who have been shifting in and out of Antarctica after short solo stays, the pioneer families are to stay for two years.

The plan is to increase the long-term colonists to 20 families in five years.

Here's a find that's mammoth

Fairbanks, Alaska (UPI)—The eight-foot-long tusks and the skull of a well-preserved mammoth that died 15,090 years ago have been found near a gold-mining site, the University of Alaska-Fairbanks said.

The bones were flown* from the site near McGrath, Alaska, to the university, and owners of the mine have agreed to allow further exploration of the area for more remains of the ancient beast.

Q. What factors determine the treeline, the level on a mountain above which trees do not grow? I have noticed that the altitude of treeline is very different in different parts of the world.

A. Generally speaking, the treeline in the Northern Hemisphere is found to follow the so-called "10-degree isotherm" — a line above which the mean temperature in July fails to exceed 10 degrees centigrade (50 degrees Fahrenheit). Many species can stand dreadful cold in the winter, but what they cannot tolerate is insufficient warmth and a summer growing season that is too short. Thus, the treeline can be low in parts of Scotland or Scandinavia, where summers are chilly though winters are not fierce.

India sets up 1st permanent research post on Antarctica

NEW DELHI, India (UPI) — India established its first permanently manned research post on Antarctica Tuesday, solidifying its membership in the group of nations that sets policy on the frozen continent, officials said.

After a 24-day trip from Goa, the 83-person expedition climbed down from its chartered Finnish ice-breaker and immediately began setting up the research post.

It was India's third expedition to the frozen continent. Sixteen scientists plan to live in the station and conduct experiments for four months. A fourth expedition is planned for March 1985.

The second group of scientists will stay in Antarctica for two months, experimenting in meteorology, geophysics, oceanography, glaciology and microbiology, officials said.

Officials of the Indian Department of Ocean Development said.

Prime Minister Indira Gandhi sent her wishes for success after a radioed message announced the expedition had arrived and that weather conditions were good.

An objective of the \$35 million expedition is to consolidate India's position as a member of the exclusive group of nations that sets policy on the continent, believed to be rich in minerals.

India was formally welcomed this year to the group of 16 countries that qualify for membership on grounds they have made "substantial contributions to scientific knowledge" in the Antarctic.

The qualifications for membership are stipulated in a 24-year-old treaty that has become controversial because some developing nations contend it is too exclusive.

India sent expeditions in 1981 and 1982 that explored the area oceanographically and conducted geological surveys of the continent's mineral and oil wealth.

The current expedition, under the leadership of geologist H.K. Gupta, traveled to Antarctica on the ship *FinnPolaris* with gear including snow scooters, helicopters, bulldozers and other equipment.

Earth Said to Be in 'Icehouse'

New theories explain why polar regions were once much warmer.

By WALTER SULLIVAN

The New York Times / Sept. 20, 1983

DESPITE the long hot summer, some scientists insist that the earth is now going through what they say, comparatively speaking, is an Icehouse Age.

That belief was advanced this month by separate authors in the journal *Nature* and in the *American Journal of Science*. Both reports describe a hotter period, a "greenhouse age," more than 50 million years ago. The critical element, the reports say, in switching from one climate to another is the amount of carbon dioxide in the atmosphere.

The report in *Nature* proposes that there have been prolonged periods alternating between those dominated by a "greenhouse effect" of abnormal warmth and those subject to an "icehouse effect" in which the polar regions become frigid and ice ages tend to occur.

The new theories offer an explanation for a well-known fact: through much of history, a large part of the world has been far hotter than now. More than 50 million years ago land areas nearest the North Pole harbored sequoias, ancestral horses, alligators and lemurs.

Reason for 'Greenhouse Effect'

The earth was hot, it is now pro-

posed, because there was far more carbon dioxide in the atmosphere than now. The gas would have absorbed heat radiation that would otherwise have been reflected into space—the so-called "greenhouse effect." Even though today carbon dioxide in the air is increasing through fuel combustion, it is far from the high levels postulated for some past epochs.

An explanation for the relative abundance of carbon dioxide at varying times in the past, such as the period 50 million to 150 million years ago, is spelled out in the *American Journal of Science*. At that time the supercontinent Pangaea was breaking up into the continents of today, and new oceans such as the Atlantic were forming between them.

The favored explanation for the high sea levels is that volcanic activity associated with splitting apart of the oceans raised their floors and flooded the land.

Such activity, it is proposed, would have increased the atmosphere's carbon dioxide in two ways: by spewing the gas directly into the atmosphere and by submerging large land areas.

Carbon dioxide in the air combines with silicate rocks to produce such carbonate minerals as dolomite, but with extensive areas under water such removal of atmospheric carbon dioxide by weathering was greatly curtailed.

This explanation is advanced by Dr. Robert A. Berner of Yale University, Dr. Antonio C. Lasaga of Pennsylvania State University and Dr. Robert M. Garrels of the University of South Florida.

Evidence for periodic increases of carbon dioxide in this manner is presented in the Sept. 1 issue of *Nature* by Dr. Philip A. Sandberg of the University of Illinois in Urbana. It fo-

cuses on variations in the mineralogy of tiny calcium carbonate spheres deposited in the oceans during various epochs of the earth's history.

In periods of high carbon dioxide, according to the hypothesis, these spheres, or "ooids," were predominantly in the calcite form. At other times, including now, they have included the type known as aragonite.

The Precambrian Era, more than 600 million years ago, and the Permian Period 250 million years ago were, like the present, "aragonite" epochs. The long intervening periods were presumably dominated by carbon dioxide. They coincided with worldwide formation of granite structures probably associated with intense volcanic activity and continental flooding.

That the atmosphere 50 million to 150 million years ago may have contained four times as much carbon dioxide as today is suggested by a computer simulation of global climate in that period by Dr. Eric Barron at the National Center for Atmospheric Research in Boulder, Colo.

While the altered geography of that period made for a warmer Arctic, only by greatly increasing the "greenhouse effect" has Dr. Barron been able to account for the high temperatures indicated from geologic evidence.

Arctic hurricanes

This winter, meteorologists will investigate the strangest, least understood weather phenomenon on Earth: vest-pocket hurricanes that howl out of the Arctic.

Hurricanes breed above the Arctic Circle during the winter.

They're quite different from tropical hurricanes, and not as dangerous, but

Arctic hurricanes can generate 100-mile-per-hour winds, mountainous seas and crackling thunderstorms.

However, the northland storms are relatively small (120 to 180 miles in diameter compared to a tropical storm's 500-to-600-mile diameter), travel only a couple of thousand miles, and last only a few days.

The Arctic storms apparently are caused by extremely frigid air pouring over the relatively warm water of the North Atlantic and North Pacific. That sets off a weather explosion: a storm immediately begins brewing and becomes a full-fledged hurricane in a matter of hours.

Meteorologists believe about two dozen Arctic storms occur between November and May, reaching peak frequency in February.

American, British and Norwegian meteorologists will make 11 research flights into the storms this winter, with the first missions flying from Keflavik, Iceland, in mid-January. Later missions will be flown from Bodo, Norway.

The Norwegians want to know more about the storms so they can protect their large fishing fleet, while the Americans and British are worried about the storms' impact on North Sea and Arctic oil rigs.

The Icy Grip Of Incompetence

A bone-chilling battle against 12-foot-thick Arctic pack ice provided Soviet newspaper readers with a dramatic diversion from everyday drabness last week. But after all the rhapsodies on maritime heroism, Pravda announced that bureaucrats, not ice floes, were the true villains.

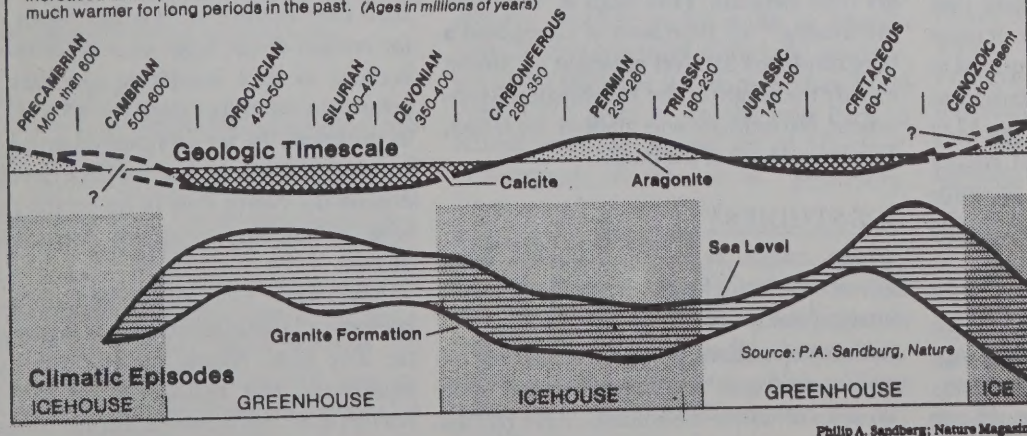
At least 30 ships were damaged and one sank when an early freeze cut off the supply route to the rapidly expanding economy of the northern Siberia coast. Up to 40 freighters and tankers with an estimated 1,000 crew members were stranded in the ice or Arctic ports. A flotilla of icebreakers led by the nuclear-powered Leonid I. Brezhnev towed them out, sometimes at painfully slow speeds of less than one mile per hour.

Moscow headlines at first hailed "Heroism" and "Drama and Feats in the Polar Sea." But Pravda, the voice of the Communist Party, concentrated its fire on shoddy, inefficient and uncoordinated performances in the responsible ministries. The Arctic fleet was largely obsolete, it said, and Gossnab, the state supply committee, had let ships stand idle for days because of inefficient loading and scheduling.

Food, fuel and water, which must be shipped in during the brief Arctic summer, reportedly were short in Pevek, Billings and Norilsk, Russia's northernmost city—centers for Siberia's mining economy. The Government newspaper *Izvestia* said only a minuscule fraction of the needed goods could be delivered by air. It was time, Pravda said, to build an all-weather road to the Arctic ports. The New York Times / Oct. 23

The Earth's Fluctuating Climate

Increased atmospheric carbon dioxide caused by continental breakups is believed to have made the earth much warmer for long periods in the past. (Ages in millions of years)



Periods of calcite formation correspond to high atmospheric carbon dioxide and thus to warmer weather. Aragonite deposition occurred when carbon dioxide levels were low. Rates of granite formation refer to North America and are an index of volcanic discharges of carbon dioxide. Sea level is also linked to climate change.

Ice worms and other wintry wonders

by Don Dedera

ICE IS ONE OF THE SMALLER words we can say and write in our language. But ice is a vast and complicated subject. And for the United States today and tomorrow, ice is of increasing consequence.

Ice is a cube clinking in crystal. Ice also grips enormous polar realms. Ice often prevails; usually rules. More than any other natural force, ice is associated with the Arctic and other frosty frontiers where the nation's energy future lies.

Eventually, the well-being of America may depend upon knowledge of ice: what it is, how it behaves, in which ways it can be manipulated.

DEGREES OF COLD

Eskimos employ more than a hundred words to define the subtle differences in ice. In English some of the terms translate: ice flower, sheet ice, pancake ice, ice melt pool, pressure ridge. In one solid form, the molecule of water influences the hexagonal shape of a snowflake. But in some situations, ice can be as strong as concrete.

HEAT IN ICE?

Ice seems curiously different in physical properties. Almost every substance will shrink as temperature drops. But water expands and becomes lighter when it freezes. Thus, ice floats. If ice did not exhibit this unusual property, it would sink and fill the oceans. Some scientists speculate that such an Earth could not support life. It takes a lot of heat to melt ice. The heat required to thaw a block of ice could raise the temperature of the same amount of water from 32 to 176 degrees Fahrenheit. The heat energy required to melt a small iceberg theoretically could drive an ocean liner across the Atlantic a hundred times.

ICY EXTREMES

There's enough ice in the Earth's polar caps to cover the world's land mass 600 feet deep. If all that ice melted, the seas would rise almost 300 feet, and as one writer has put it, "Most of us would be blowing bubbles."

High altitude and continuous winter darkness make the interior of Antarctica the world's deep freeze; coldest recorded: minus-126.9 degrees Fahrenheit, in 1960, at

Ice, the most formidable physical phenomenon of the Far North, is both friend and foe to Exxon as the company seeks to develop the oil and gas potential of Alaska.

a Russian Antarctic mountain base. Was the coldest northern record at the North Pole? No way. It was minus-96 degrees Fahrenheit in eastern Siberia, 1964, 100 miles south of the Arctic Circle. Coldest recorded in Alaska was minus-81 degrees Fahrenheit along the Trans-Alaska Pipeline near the Arctic Circle.

COLD OR WET

Oil explorers insist they wish they could strike their new fields inside their refinery gates. How efficient! In reality, the best petroleum prospects lie in Alaska and in offshore areas. It is estimated that one-half of all the oil to be consumed in the year 2000 is yet to be discovered. The most promising frontiers occupy remote, hostile regions of the world. Because much of that frontier is icy, Exxon has made itself a world leader in its knowledge of ice and ice dynamics.

A WATER SOURCE

The idea of fetching icebergs to needful temperate climates goes back at least to Erasmus Darwin, grandfather of Charles. More recently scientists of Scripps Institution of Oceanography detailed a scheme to tow a berg from Antarctica and park it outside Los Angeles Harbor as a source of fresh water. What's a big iceberg? The largest ever sighted was 12,000 square miles, bigger than Belgium. How high is "the tip of the iceberg?" In 1958 west of Greenland a berg displayed 550 feet of height — almost exactly the height of the Washington Monument. No estimate was made of the larger, submerged bulk of the berg.

ICE STUDIES

Three major types of pioneers have advanced knowledge of cold regions: intrepid early adventurers and scientists; military operations planners; seekers of oil and natural gas. All three, drawing upon wisdom of native inhabitants, have refined arctic engineering to a high art.

Case in point: the Northwest Passage. A vision of 20 generations of mariners — the Cabots beginning in 1497 followed by Dutch, French, Danish, and English sailors. In 1942 a Canadian schooner achieved

the passage west-to-east. Surface ships ventured into Baffin Bay to dodge a parade of 50,000 bergs. Atomic submarines negotiated the Arctic Ocean's depths.

Then, in 1969, discovery of billions of barrels of oil beneath Alaska's North Slope gave renewed priority to a commercial Northwest Passage. A consortium led by Exxon converted the 150,000-ton *Manhattan* into the world's largest icebreaker to traverse the passage east-to-west.

At a cost of \$50 million and assisted by a conventional Canadian icebreaker, the *Manhattan* battered to Alaska and returned with a symbolic barrel of Prudhoe Bay crude. Scientists also brought back a wealth of new information about the North. And of ice: thickness, age, strength, chemical composition, crystalline structure. A decade of revolutionary research and ice technology followed.

THAWING A MYTH

An encyclopedia of fresh knowledge flows south from the Arctic Ocean. The polar pack covers 5.5 million square miles, extends 1,400 miles from the North Pole toward Alaska, and 700 miles on the other side toward Siberia. The permanent sheet of polar ice is the size of the lower 48 states.

Yet, for all the solid science, myths persist.

Myth one: Arctic ice is an unbroken mass, very thick, and usually stationary. *The facts:* Even in the dead of winter, open leads (or cracks) divide huge sections of the ice; because of ice's insulating qualities, the polar pack typically ranges from 9 to 15 feet in thickness; the ice gets pushed around by currents and winds. The ice pack circulates around the North Pole in an erratic clockwise motion known as the Arctic Gyral Stream.

Myth two: Even in modern times, ice prevents all maritime commerce in the Arctic. *The facts:* Nearly all of the heaviest equipment and machinery for Alaska's northern oil fields moved during summers through relatively ice-free waters of the Chukchi and Beaufort Seas.

Myth three: Once ice starts moving, nothing can withstand it. *The facts:* Ice research and development experts in recent times have devised ingenious and practical

EXXON USA

SECOND QUARTER, 1983

systems and strategies for parrying the thrusts of sea ice.

THE UNSINKABLE

One Geoffrey Pike during World War II proposed the construction of a gigantic aircraft carrier combining ice and sawdust. *Habakkuk* was to measure 2,000 feet by 300 feet and displace 2 million tons. Vice Admiral Lord Louis Mountbatten is said to have given serious consideration to the scheme and even proposed it to Winston Churchill in 1942. Skeptics crushed the program. Pike scornfully offered a suitable motto: "Nothing must be done for the first time."

BUILDING WITH ICE

Today, Pike would have a model to refer to. In their work in the Far North, oil companies use ice as a building material. The pilings that support buildings at Prudhoe Bay are firmly anchored in frozen soil. The method is simply to drill a hole, set the piling in place, and pour a sand-and-water slurry around it. The slurry freezes and immobilizes the piling as firmly as if concrete were used.

Exxon has experimented with building an ice island, not as large as *Habakkuk*, but of 26 acres in size. It was made by pumping water onto ice, allowing it to freeze, and repeating the procedure until a 30-foot high layer cake was built. While never used for that purpose, the island could have easily supported a drilling rig.

Currently, plans are being considered for a drilling barge that will surround itself with an ice wall. Using water cannons, the barge would spray water around its perimeter to create a protective barrier against the movement of ice floes in the vicinity.

ICE WORMS?

Alaska newcomers (called *cheechakos*) routinely hear about *ice worms*, which allegedly thrive inside glaciers. Generally considered a hoax, the ice worm does prosper in the frozen North. Dr. G. F. Wright, 1887, Muir Glacier: "In the shallow enclosures on the surface containing water and a little dirt, worms about as large round as a small knitting needle and an inch long are abundant." By now, some 60 species of snow and ice worms of the genus *Mesenchytracheus* have been described in Alaska.

QUICK FREEZE

If conditions are just right, that is, dry, supercold, during an Alaskan winter, you



Researcher at a Canadian drill site's ice field.

can take a glass of water outside, toss it upward, and watch it float off as instantaneous ice fog. According to Professor Larry Gedney of Alaska's Geophysical Institute in Fairbanks, many a saloon bet has been won on the wager that boiling hot water will freeze faster than plain cool tap water. The hot water *will* freeze faster — if conditions outside are perfect and the water samples are set out in styrofoam cups. The oddity has to do with evaporation, molecular motion, and a paucity of dissolved gases in the boiled water.

THE ICE AGE

Of glaciers, Alaska's Malaspina flowing from the slopes of Mt. Saint Elias, is larger than Rhode Island. But formidable as are today's ice caps and ice fields (covering 10 percent of the Earth), they pale beside the geological record. Some 23,000 years ago glaciers occurred as far south as Mexico City. Nearly one-third of the land was buried under thick ice. It took more than 4,000 years for a layer of ice one mile deep to retreat from the present site of Hartford, Connecticut, to that of St. Johnsbury, Vermont, 190 miles away.

MOVING ISLANDS

No saga of arctic inquiry is more secretive than that carried forth by military powers from ice islands — actually, huge, long-lasting chunks of glaciers which migrate midst polar sea ice. Resupplied by air, largely supported by American and Russian armed forces, scientists and technicians since the mid-1940s have occupied various stations for study of weather, currents, sea bottoms, life forms, radio and radar signals, and ice.

But a bonus on both sides of the Arctic has been extension of civilian and commercial ability to construct and operate in far northern latitudes. A great deal of ice research is open and freely shared among government agencies and corporate units.

DEFEATING SEA ICE

Other useful parcels of arctic real estate are true islands, both natural and manufactured. First proven in Canada, gravel-and-sand islands today provide safe and stable platforms for exploratory drilling offshore in Alaska's Beaufort Sea. In a typical winter-time island construction, blocks of ice are removed from the sea. Earthen materials trucked from shoreside quarries via an ice road are poured through the ice openings until a gravel island — say, 400 feet in diameter — takes shape. And shape is crucial for fending off winter ice and summer waves. Says Dr. Hans Jahns, scientist with Exxon Production Research, Inc., in Houston, Texas, and authority on polar technology, "All gravel islands placed in Canadian and U.S. waters in the Arctic have successfully withstood waves and tides from summer storms and ice forces due to the movement of the surrounding ice sheet."

Adds another EPR physicist, Dr. John Prince, "It's little appreciated, but in truth, hundreds of millions of dollars have been spent in government, university, and industry studies in both Canada and the United States. We've done our homework. Our designs function. And with no significant impact on the environment."

PAMPERING PERMAFROST

In 1968, after the discovery of petroleum at Prudhoe Bay, engineers began to ponder

how a large diameter pipeline could be built to deliver the crude oil to market. Many issues were involved in pipeline design and construction. A major technical concern was permafrost. Permafrost is permanently frozen ground that often contains more ice than soil. Scientists feared that oil hot from the earth's interior might transfer heat through the pipeline walls to surrounding soil and melt the permafrost. This could produce erosion, subsidence, possible damage to the pipeline itself. So, for much of its length, the pipeline was constructed above ground. Where burial was necessary in areas where ice-rich permafrost was present, refrigeration was provided to keep the permafrost frosty.

UNDERSTANDING ICE

Regarding arctic ice research, some goes back to Eskimo origins and some seems akin to the space age.

Consider this sampler:

- From airborne and subsea devices, scientists have scanned the ice with laser beams, infrared cameras, sonar, and radar to determine type, age, shape, thickness, composition, and strength of ice.
- Supercold rooms in places such as Houston and Calgary make possible realistic experiments on real and simulated arctic ice. The work is carried forth by fulltime scientists supported with the most advanced data processors.
- Pressure sensors in sea ice around man-made islands can relay a constant stream of up-to-the-minute data via satellite or telephone to Exxon monitors in Anchorage, Los Angeles, or Houston.
- The world's largest ice-testing basin, operated by Esso Resources Canada, Ltd., at Calgary, has yielded knowledge of the behavior of sea ice and formation of ice-rubble fields around an obstacle. From this research came designs for gravel islands that can form their own protective ice rubble fields during periods of ice movement.
- Defensive methods are now well understood for lessening the threat of ice assault on a gravel island. One tactic: A ditch is cut into the ice, altering the ability of ice to exert pressure on an island.

By such inquiries, the means for discovering and producing tomorrow's petroleum are devised for the Far North. Ice remains a formidable force, but no longer is ice a mystery.

DON DEDERA

Glacier surge

Daily News-Miner, Fairbanks, Alaska

The Variegated Glacier, a little-known glacier located in the St. Elias Mountains near the head of Yakutat Bay, has become one of the hottest glaciers around.

In early 1982 the glacier began a catastrophic advance or surge. The last such activity occurred there in 1964, resulting in dramatic change in the surface of the glacier. Last July 5 the surging stopped abruptly and again the topography of the glacier had undergone spectacular change. A scientific team led by Dr. William Harrison of the University of Alaska-Fairbanks, visited the glacier in early September confirmed the surge had ceased.

Harrison, along with Dr. Charles Raymond of the University of Washington, Dr. Barclay Kamb of California Institute of Technology, and other American and European scientists, students and technicians, have been monitoring Variegated Glacier for 10 years.

Surges are periodic glacier advances generally unrelated to climatic change. They occur only in certain spots of the glacier covered areas of the world, including Alaska and the Yukon Territory.

The study of Variegated Glacier is the most detailed observation of a surging glacier made to date. The glacier team observed speeds up to 200 feet or more per day during the height of the surge.

As a result of their Variegated Glacier observations, scientists believe that water is a key factor in glacier surges. Their idea is that because water floats ice, accumulated water may cause partial floating and rapid motion in some glaciers. The rapid motion in turn, eventually leads to a bursting of a drain that produces violent flooding of the accumulated water from beneath the glacier. This occurred from Variegated on July 5, the same time that the rapid motion ceased.

But by then drastic changes in the surface topography of the glacier, in some cases approaching 300 feet, had occurred. The changes in ice thickness seem to have an effect on plumbing and water pressures under the glacier, and therefore on its future motion.

According to Harrison, the surging observed at Variegated Glacier is unlikely to occur again for another 20 years or so. "The pattern of surges observed for Variegated Glacier suggests a recurrence of roughly 20 years for it," he said.

It remains unclear why only some glaciers undergo large surges and why they seem to be concentrated in certain areas. Harrison said size doesn't seem to be a factor. "Variegated Glacier is actually a small glacier in comparison to others," he said. The glacier is about 15 miles long.

"Surges are not unknown to Alaskans," Harrison said. "Oldtimers will recall the surge of the Black Rapids Glacier near Black Rapids in 1936 which threatened the Richardson Highway." U.S. Geological Survey scientists have pointed out that the Richardson Highway is built on a moraine deposited by an earlier surge that blocked the Delta River, possibly sometime in the last century.

Climate normally controls glaciers, but surges occur independently of climate changes. According to Dr. Harrison, some scientists speculate that glaciers have the capacity to control climate.

Sperm whales have the biggest, and possibly the most complex, brains of any animals that ever lived.

The bottlenose whale has been known to submerge for as long as two hours.

Hopes for an Eskimo Territory Rise in Canada

By MICHAEL T. KAUFMAN

The New York Times

FROBISHER BAY, Northwest Territories — If things go the way Canada's Eskimo groups want them to, then within two or three years this town of imported houses and 2,500 people could become the capital of a new treeless Canadian territory to be called Nunavut.

The idea of carving such a political area out of the present Northwest Territories was approved in a territorial plebiscite 16 months ago. It has the endorsement of the federal Government in Ottawa.

It also has the weight of precedent behind it since the Canadian provinces of Alberta and Saskatchewan and the Territory of the Yukon were all carved out of the huge Northwest Territories, a sparsely populated land often described as the residue of Canada's nation-building efforts.

Nunavut means "Our Land" in Inuktitut, the language of the local people. According to John Amagoalik, president of the Inuit Tapirsat, the major Canadian Eskimo organization, all that remains to be done before Nunavut comes into being is to conclude negotiations with the federal Government on land claims, determine the boundaries of the proposed territory and draw up a territorial constitution. This last chore is to be tackled at a constitutional convention now scheduled for this fall.

John C. Munro, Canada's Minister for Indian Affairs and Northern Development,

restated the Government's approval of the Nunavut concept when he spoke here last month at a meeting of Eskimo leaders from Alaska, Greenland and Canada. "The Government," he said, "has accepted the division of the Northwest territory in recognition of the longstanding aspirations of native northerners."

The idea for a Nunavut territory north of the tree line first arose in the late 1960's. It was then that leaders of Canada's 25,000 Eskimos awoke to the prospect of paternalistic inundation by southerners who earlier, for many years, had administered the far and icy north with what Louis St. Laurent, Prime Minister from 1948 to 1957, characterized as "an absence of mind."

The idea coalesced further when western Canadian Eskimos began to learn of the large land claim settlements concluded by Eskimo groups in Alaska. At that time there was opposition in Ottawa to the establishment of any political division that appeared to be an ethnic state. With the central Government eager to extend federal authority and erase the specter of separatism and fragmentation that had been raised by Quebec nationalists, the notion of an Eskimo state was

regarded with suspicion.

Peter Jull, a southern white who has been working with the Inuit Committee on National Issues to advance the idea of Nunavut, said that all the Inuit people were agreed that full political rights in the new territory would be

open to all citizens living within the region, regardless of origin.

Eskimo leaders like Mr. Amagoalik stressed the need for Eskimos to participate in political processes and shed the apathy and alienation that has enabled white candidates to win mayoral elections here in Frobisher Bay, the largest Arctic settlement, where Eskimos represent 70 percent of the population.

Though they carefully shun any talk of ethnic politics, it is clear that the Eskimo leaders expect that the basic demographics of the situation will eventually bring their people into the political process and into political power. As envisioned by several leaders, Nunavut will embrace northern and eastern sections of the present Northwest Territories that contain roughly 18,000 people, almost all of them Eskimo.

According to both Eskimo leaders like Mr. Amagoalik and government officials, there is still a great deal of negotiation needed on land claims and on the boundaries of Nunavut that Ottawa insists must be concluded before the territorial division.

In June Prime Minister Pierre Elliott Trudeau visited Inuvik, a western Inuit center, and declared that he understood the importance of the decisions facing the Eskimo people.



Survivor of Wrangel Island colony dies

ANCHORAGE (AP)—Ada Blackjack Johnson, the only woman member and the sole survivor of the 1921-1923 expedition which attempted to colonize Russia's Wrangel Island, has died in Palmer. She was 85.

Ms. Johnson was taken on the five-member expedition as a seamstress to sew fur clothing and drew attention when she was rescued in 1923 from the island 85 miles off the northeast coast of Siberia.

A chapter of Arctic explorer Vilhjalmur Stefansson's 1925 book, "The Adventure of Wrangel Island" was devoted to Ms. Johnson. Stefansson organized the expedition.

She was left alone on the island for months caring for a member of the party who contracted scurvy and later died. Three other members of the expedition had set out earlier in 1923 to return to civilization. No trace of those men ever was found.

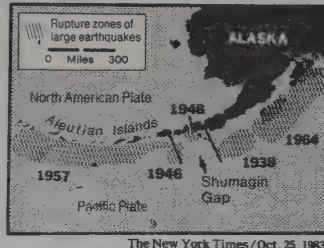
The attempt to colonize Wrangel Island was part of an international race to gain control of the nearly inaccessible bit of land in the Arctic Ocean.

Great Earthquake Likely Off Alaska as Ocean Floor Slips

DURING the past decade, intensive monitoring of earthquake activity and tilting of the landscape on the Shumagin Islands south of the Alaska Peninsula has indicated deep slippage of the Pacific floor under that zone, increasing stress and making a great earthquake more likely.

The area has been free of major quakes far longer than most of the rest of the zone of frequent earthquake and volcanic activity along the south coast of Alaska and the Aleutian Islands. The zone marks where a plate of the ocean floor, known as the Pacific Plate, is inexorably descending under a plate that forms Alaska and the Aleutians.

For several years seismologists at Columbia University's Lamont-Doherty Geological Observatory have been warning that within the next two decades a very large earthquake is likely to occur in the "Shumagin gap," where a relief of stress is long overdue.



herty Geological Observatory have been warning that within the next two decades a very large earthquake is likely to occur in the "Shumagin gap," where a relief of stress is long overdue.

In the Oct. 21 issue of *Science* they report that the apparent slippage at great depths, now believed to have occurred between 1978 and 1980, would have caused "an increase of stress on the shallow locked portion of the plate boundary, bringing it closer to rupture in a great earthquake."

In the past, earthquakes in this vicinity have generated tsunamis, giant ocean waves that have caused severe damage and loss of life as far away as California and Hawaii. In 1946, an earthquake on Unimak Island, west of the Shumagins, toppled the Scotch Cap lighthouse into the sea and created one of the worst tsunamis on record.

Lines across the Shumagin Islands, usually resurveyed yearly, have shown tilting of the land toward the ocean side, presumably caused by the drag of the descending plate. From 1978 to 1980 the tilt reversed, however, a fact taken as evidence for almost three feet of slippage at depths below 12 miles.

Because there had been no indication of stress relief from earthquakes at shallower depths, a major quake may be imminent. A further ominous sign, according to the report, has been the quiescence of Pavlov Volcano nearby on the Alaska Peninsula. Normally, it erupts more often than any other North American volcano.

Authors of the report were Drs. John Beavan, Egill Hauksson, Stephen R. McNutt, Roger Bilham and Klaus H. Jacob.

Arctic Theory on Animal Origins Advanced Baby penguins survive despite early problems

By WALTER SULLIVAN

The New York Times / Sept. 17, 1983

The hypothesis that ancestors of such plants and animals as the giant sequoia, alligators, horses and lemurs appeared on the fringes of the Arctic Ocean millions of years before they did so at lower latitudes has been advanced by the directors of two leading natural history museums and two other specialists.

The idea, which is bound to touch off scientific debate, is based on a new timetable of evolution in the Far North. It appeared in yesterday's issue of the *Journal Science*.

Many plant and animal species, the researchers say, may first have evolved in the Far North. That they once lived there is noncontroversial. In recent years their fossils have been found in such bleak places as Ellesmere Island, northernmost of the Canadian islands, and it is well known that the polar regions have been warmer than today through much of the earth's history.

However, the proposition that such plants and animals actually evolved on the fringes of the Arctic Ocean is certain to encounter challenge. That, nevertheless, is the argument advanced by Leo J. Hickey, director of the Peabody Museum of Natural History at Yale University; Robert M. West, director of the Carnegie Museum of Natural History in Pittsburgh; Mary R. Dawson, curator of vertebrate fossils at the Carnegie Museum, and Duck K. Choi, a specialist in identifying fossil pollens at Pennsylvania State University.

Based on Fossil Chronology

They believe some prehistoric species, such as the dawn redwood, ancestor of today's largest living trees, appeared in the Far North some 18 million years before they appeared in their present habitat further south. Likewise alligators, flying lemurs, whose closest modern relatives are found in Philippine jungles, and coryphodons, grazing beasts about the size of cows, and the little dawn horse, or *eohippus*, all

roamed the Arctic long before they reached the south.

This assertion is based on a chronology of the fossil beds derived from the history of polarity reversals in the earth's magnetic field.

Such reversals occur at irregular intervals, reckoned in thousands and millions of years. Sediments or volcanic rocks being laid down today are becoming imprinted with a weak magnetic field aligned with that of the earth. When the polarity is switched, or when the "North" needle of a compass would point South, the deposits are imprinted with reversed polarity.

Where the record of rock deposits is long enough, layers of alternate polarity make it possible to coordinate local readings with others all over the earth, reading the age of a particular deposit like identifying a particular year in a slice of tree trunk.

This has now been done, the authors report, in deposits along Eureka Sound between Ellesmere and Axel Heiberg Islands. Furthermore, they say, the resulting chronology has been confirmed

by the presence in associated deposits of oceanic fossils consisting of mollusks and dinoflagellates, used world wide for age correlations.

Their new chronology challenges the orthodox position that the perissodactyls, the ancestors of the horse and other large grazers, originated in Central America. In the journal article, the authors stated, "On the basis of the magnetic correlation we propose the primary radiation, if not the origin, of this group may well have taken place not in the subtropics but in the Arctic."

Citing the huge land area of the Arctic and the special combination of prolonged summer daylight with a prehistoric mild climate, they said it was "at least plausible" that this currently inhospitable region "may have served as the birthplace for important biotic innovations and for major groups that later radiated to lower latitudes."

Glaciers cover about 3 percent of Alaska.

Trans-Alaska Pipeline delivers 3-billionth barrel of crude oil

The three-billionth barrel of crude oil to be transported through the Trans-Alaska Pipeline arrived at the line's terminus in Valdez Thursday.

The milestone barrel arrived at 9:26 a.m., taking five days and 10 hours to make the 800-mile journey from Alaska's North Slope, according to Alyeska Pipeline Service Co. President Frank Turpin.

The pipeline transports about 1.6 million barrels per day, he said — 1.5 million barrels from

the Prudhoe Bay field, and 100,000 barrels from the Kuparuk field west of Prudhoe.

The first barrel of North Slope crude was shipped through the pipe nearly six years ago, on Aug. 1, 1977. Since then, more than 3,700 tankers have been loaded with North Slope oil at the Valdez Terminal, Turpin said.

Oil transported through the pipeline provides about 18 percent of total U.S. production, and about 11 percent of domestic consumption, he said. July 22

Associated Press

San Diego — The first two penguins hatched in Sea World's new exhibit "The Penguin Encounter" have survived problems of their early days and are getting fatter and fluffier in a nursery freezer.

"They're on ice . . . They just sit there," said Sea World spokeswoman Jackie O'Connor. "They are both in the nursery isolation freezer, now chilled to 20 degrees."

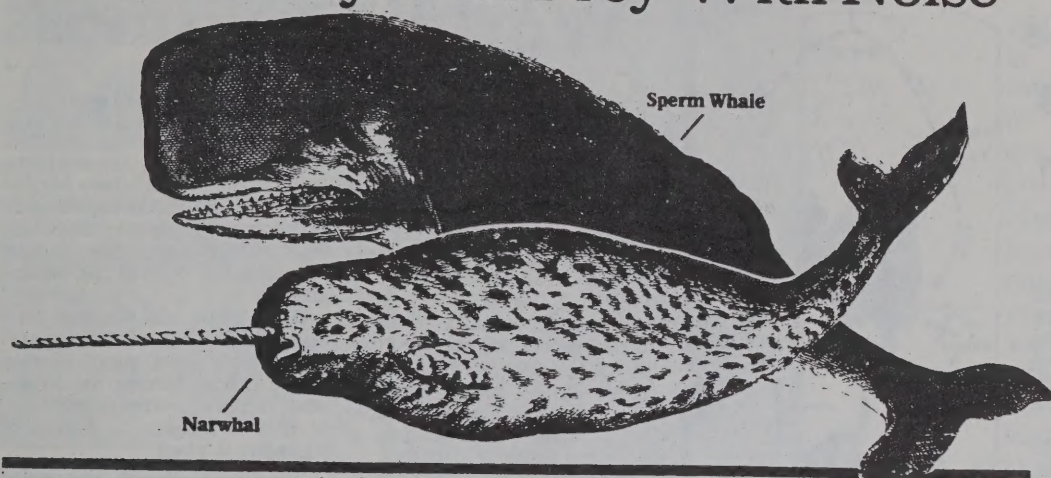
Both K.O., who now weighs almost 13½ pounds, and The Kid, a hefty 7 1/3 pounds, were neglected by their parents after being hatched in September.

The baby Emperors, who grow to be about three feet tall, were initially kept warm in infant isolettes like those used for premature human babies, then transferred to cooler surroundings. "When they get too warm, they actually begin to pant," said Ms. O'Connor.

The baby birds won't be placed back in the penguin exhibit until January. They never see their parents, but Ms. O'Connor said they have stuffed toys in the freezer with them.

"They still have the instinct to be brooded, to lean up against something that is a parent or as good as a parent, so the stuffed toys are good for that," she said. "They also spend time stretching and strengthening their flippers."

Whales May Stun Prey With Noise



HOW do whales catch their prey? The process has been a mystery in the case of toothed whales since marine creatures found in their stomachs show no teeth marks.

The explanation, according to Kenneth Norris, professor of natural history at the University of California at Santa Cruz, may lie in what he calls his "big bang" theory: toothed whales use intense bursts of sound to stun their prey.

All 68 species of toothed whales (a suborder that includes dolphins as well as giant sperm whales) use sound to locate their victims, as noted in the university's Science Notes. Dr. Norris, a specialist in marine mammals, believes this sound-generating ability

may have evolved to sufficient intensity to become a weapon, and that their teeth have become vestigial organs, like the appendix in humans.

He points out that millions of years ago their common ancestor had a narrow, tapering jaw streamlined for speed and bristling with long rows of sharp teeth. Yet many of today's descendants seem poorly equipped for hunting. "For some reason," he says, "they no longer need to surprise their prey or entrap it quickly."

Giant squid found in the stomachs of mature whales show no bite marks and some have been seen to swim unharmed out of a whale's gaping jaws. The male narwhal has no teeth, apart from a single spiral tusk that extends almost eight feet in front of it —

presumably more of an impediment than an aid in catching the swift shrimp on which it feeds.

"You look at these animals and you wonder what's going on," Dr. Norris says. "How in the world do they get lunch?"

In the open sea there is no easy way to determine the intensity of sounds emitted by members of this group, known as the odontocetes. It is difficult to tell whether a sound came from a nearby animal or was generated with great strength by a more distant whale. Some evidence from studies with dolphins, beluga whales and pilot whales, however, indicates that they produce considerably more intense sounds than had been believed.

Although most of the permafrost on earth came with the last great glacial period about 10,000 years ago, it continues to grow under some conditions. Dr. Jerry Brown, of the U.S. Cold Regions Laboratory in New Hampshire, said that over the past two to three decades permafrost has formed in the mine tailings of Fox, just north of Fairbanks.

"There are a few spots of residual permafrost in Anchorage that can be very dangerous," Pewe said at the conference. Much of the Fairbanks North Star Borough sits atop permafrost, he said.

The city of Fairbanks is built on a floodplain high in sand and gravel, and low in permafrost. The hilltops and south-facing slopes have no permafrost. But outside the city limits, between the river plain and the hills, is lowland with silt, clay and "lots of ice," Pewe said.

"Build on that and down you go" when warmth from the building thaws the ground, which then may sag, he said.

But overall in the United States, "permafrost is primarily an Alaskan problem, though it exists in the mountains of the Rockies," Brown said. "It doesn't get a great deal of attention."

Because it's not always considered a priority, permafrost research must compete for funding with other research programs.

Brown hopes to further the cause of permafrost research by showing people in the Lower 48 that they, too can benefit from permafrost studies. He notes that "many northern tier states have very deep frost in the ground, three to six feet in some areas in the winter. Under some conditions, that creates major problems, such as freezing water mains. People Outside could learn a great deal" from studying permafrost.

Little Diomede school opens

Associated Press

Aug. 28

Nome — High school students on Little Diomed Island attended classes on the island for the first time ever Monday.

The tiny island west of the Seward Peninsula in the Bering Strait is home to about 140 Eskimos, according to the 1980 federal census. The island residents, who live mostly on walrus and seal, have had to send their children away to school in the past.

Countries join forces to research permafrost

by Carol Murkowski
Anchorage Times,

In the Soviet Union, mine shafts are stabilized with artificially frozen earth. In Canada, cold ground is undisturbed by the warm oil pipelines running above it. In the United States, buildings and highways are built in areas once considered unfit for construction. And in the People's Republic of China, railways are beginning to snake across inhospitably frozen terrain.

All those problems, and countless others, have been solved with the help of permafrost research. On Friday, the four countries made known the formation of an international organization dedicated to permafrost studies.

The fourth International Con-

ference on Permafrost, held in Fairbanks this week, closed with word that the International Permafrost Association had been established.

The Canadian National Research Council will finance office space and staff support for the new organization at the University of British Columbia. The group's president is Pavel Melnikov, director of the Soviet Academy of Sciences' Permafrost Institute at Yakutsk, Siberia. Vice president of the group is Dr. Troy Pewe of Arizona State University's Department of Geology, who has more than 40 years experience in Alaskan permafrost research. Canadian research professor Ross Mackay will be secretary-general.

Any country with a national committee of scientists and engineers working on permafrost will be invited to join and have two members on the association council. The group will provide organization and continuing support for future permafrost conferences.

The fourth conference, at the University of Alaska-Fairbanks, drew more than 850 scientists and engineers from 24 countries.

The Soviet Union has the largest amount of permafrost in the world, followed by China, with more than 68 percent, and Canada, with about 50 percent. About four-fifths of Alaska is underlain by permafrost, classified as ground that is 32 degrees or colder for at least two years.

Flier finds polar trip 'fantastic'

Daily News-Miner, Fairbanks
Nov. 18

LOS ANGELES—Four hours and four minutes after leaving Fairbanks, businesswoman and pilot Brooke Knapp touched down in Los Angeles this morning to complete the first trip around the world and over both poles in a business jet.

"It was the experience of a lifetime—I mean fantastic," Knapp, 38, said as she stepped from the red-white-and-blue craft.

Waiting with flowers on the tarmac was her husband, Financial Corp. President Charles Knapp, and Allen Paulsan, president of Gulfstream and owner of the jet she piloted.

Knapp hugged her mother, then headed into a hangar to accept a telephone call from the White House.

President Reagan's comments could not be heard, but Knapp told him, "We do our best, yes, sir. That's what America is all about, meeting challenges."

She added, "See you Tuesday," accepting his invitation to the White House.

Knapp's total time enroute was just over 85 hours, which is about 24 more than she had hoped. She was grounded for a day in Brazil by landing gear problems.

Knapp and the \$14-million Gulfstream III business jet, dubbed the American Dream II, landed in Fairbanks shortly after three o'clock this morning, and were under way again at 3:51 a.m., Fairbanks time. She reached Los Angeles at 8:03 a.m., Fairbanks time.

Preparations for the trip included the carving of a 10,000-foot runway on the sea ice at McMurdo Sound in Antarctica for a refueling stop.

The crew for the trip included two copilots and two engineers, an observer from the National Aeronautic Association to certify the flight, and a photographer to record it all.

In addition to being a pilot and business executive, Knapp is a summa cum laude graduate of UCLA and holds degrees from the Cordon Bleu School of Cooking and L'Academie Maxim in Paris, France.

She crossed the South Pole on Tuesday night and the North Pole this morning.

Other aircraft have made round-the-world journeys via the poles. A Pan Am Boeing 747 covered the route in 54 hours and seven minutes in Octo-



Washington Post

By Robert Juffras

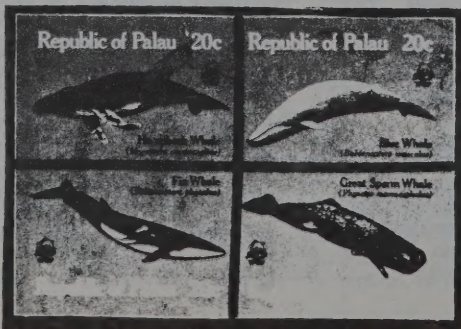
ber 1977. But Knapp's flight was the first in a business jet.

Her trip cost about \$200,000, raised from Hitachi Corp. and individual donors.

At Antarctica Station, Braving It at -128.6°F

MOSCOW, July 23 (AP) — Soviet explorers in Antarctica, experiencing conditions like "the eternal cold of outer space," have recorded a temperature of 128.6 degrees below zero Fahrenheit, a record low, the official press agency Tass reported today.

It said the record was registered Thursday on platinum thermometers outside the Soviet research station Vostok, where the previous record, 126.9 below, was recorded on Aug. 24, 1960.



World's Eskimos meet in Canada

Associated Press

July 27

Frobisher Bay, Northwest Territories — The Inuit Circumpolar Conference, representing Eskimos from Alaska, Greenland and Canada, opened its third General Assembly today with native prayers, traditional songs and an agenda ranging from folk dancing to nuclear arms.

Inuit is the name preferred now by many of the people widely known as Eskimos; a term some consider offensive.

The Inuit Circumpolar Conference, founded in 1977 in Barrow, represents the approximately 100,000 Inuit in the three countries.

Organizers had hoped that representatives of the several thousand Siberian Eskimos would be allowed to attend this year for the first time, but the Soviet government refused permission.

"I expect, as I'm sure you do, that your efforts here will contribute significantly to further promoting the rights, interest and responsibilities of the Inuit of Greenland, Alaska and Arctic Canada," Canadian Health Minister Monique Begin told the assembly.

Satellites are transmitting proceedings of the week-long meeting — with simultaneous translation in English and four Inuit dialects — to hundreds of arctic villages.

The principal goal of the assembly is to draft a Circumpolar Arctic Policy to be urged upon the governments of all three countries.

There are 25,000 Inuit in Canada, about 42,000 in Greenland — where they are the majority — and about 30,000 in Alaska.

About 500 observers, perform-

ers, members of an advisory body of elders and others participating in the conference began arriving at Frobisher Bay, an inlet on Baffin Island northeast of Hudson Bay, over the weekend.

The influx of visitors has taxed the facilities of this town of 2,400 people, just south of the Arctic Circle, forcing the Frobisher Inn to house its guests four or five to a room — and two strangers to a bed.

Workshops during the week will hammer out language on such issues as culture, transportation, whaling, health, education and environmental protection, which could include a proposal to make the arctic a nuclear-free zone.

"In the event of an outbreak of a nuclear war, we would be in the middle of everything," Amagoalik said. "Now that the government of Canada has approved the testing of the cruise missile over the Inuit homeland, we can no longer ignore it."

Canada announced this week it would allow tests of the U.S. cruise missile, which would be launched from the High Arctic and follow a path across the Northwest Territories to a target near the Alberta-Saskatchewan border.

Many Inuit also are concerned that exploitation of arctic oil and natural gas will damage the fragile environment, both because of the risk of oil spills and because year-round ice-breaking would disrupt animal migration.

The 54 voting delegates to the assembly — 18 each from Canada, Greenland and the state of Alaska — will confer around a three-sided table in the town's high school gymnasium.





Because of its geographical position, New Zealand has been used as a staging point for many Antarctic expeditions and this has forged close links with the southernmost continent. New Zealand's involvement in Antarctica is the topic of a special stamp issue featuring 4 stamps depicting areas in which some of the most important studies are currently being made — geology, biology, glaciology and meteorology.

New Zealand geologists have for many years conducted study programmes of the Beacon Supergroup rock formations of Shapeless Mountain seen on the 24c stamp and Mt Fleming at the head of the Wright Valley in the Dry Valley region of Antarctica.

New Zealand scientists have also contributed to extensive research of seal colonies like that shown on the 40c stamp. These colonies abound in the Ross Dependency and in the coastal areas of Ross Island.

"Winkie" drilling equipment seen on the 58c stamp has been used by scientists for a drilling programme in the Lower Taylor Valley. Core samples obtained from drill holes ranging in depth between 80 and 120 metres have, after analysis, added considerably to the geological knowledge and history of the region.

Both New Zealand's Scott Base and Vanda Station in the Dry Valley's region of Antarctica conduct important meteorological studies of the type seen on the 70c stamp. These include daily climatic observations along with continuous wind, temperature and pressure recordings. These observations provide data which is regularly transmitted to the New Zealand Meteorological Service.



25th Antarctic team leaves aboard new ship

Japan's 25th Antarctic observation team left Tokyo's Harumi Pier for Showa Base Monday morning aboard an advanced ship, Shirase, being used for the first time in an Antarctic mission.

The 11,600-ton Shirase, capable of breaking ice 1.5 meters thick, has capacities double those of the retired Fuji. It is also equipped with various kinds of electronic devices.

The 47-member observation team, led by Takeo Hirasawa, will continue international joint research on the marine ecosystem of Antarctica and make the first overland search

for a candidate site on which to open Japan's third base on the continent.

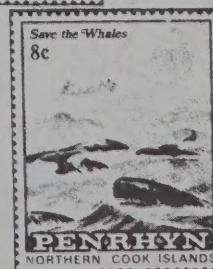
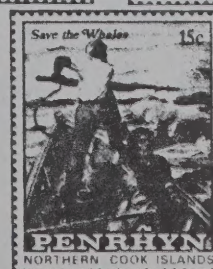
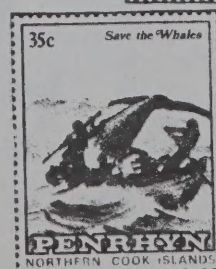
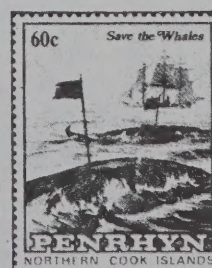
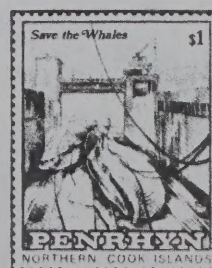
To this end, the departure of the group was moved up by about 10 days from the usual departure time in late November. After unloading supplies at Showa Base in late December, the Shirase will head for a candidate site for a new base in the east Queen Maud Land area about 600 kilometers away. The team is scheduled to build what will be the predecessor of the third base.

AMERICAN SOCIETY OF POLAR PHILATELISTS
American Society of Polar Philatelists (ASPP) is a nearly 30-year-old international organization of polar enthusiasts who are also interested in the postal history of the region. Its award-winning journal, ICE CAP NEWS, contains news of contemporary polar activity, as well as retrospective examinations of polar history and the postal history (covers and stamps) it spawned.

The bimonthly, professionally edited publication regularly prints scores of articles, features and news reports that complement what might appear in POLAR TIMES.

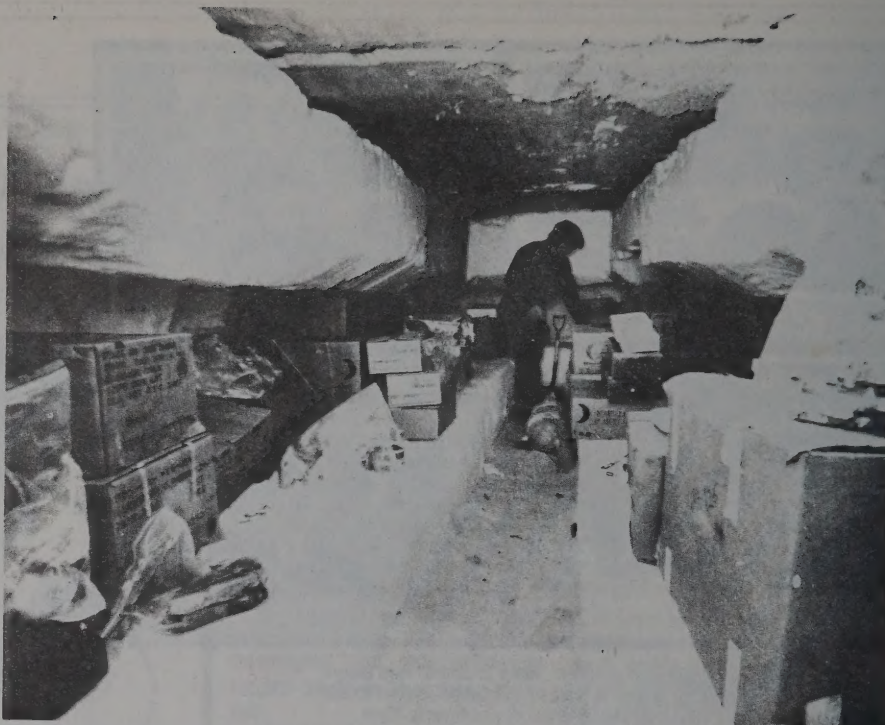
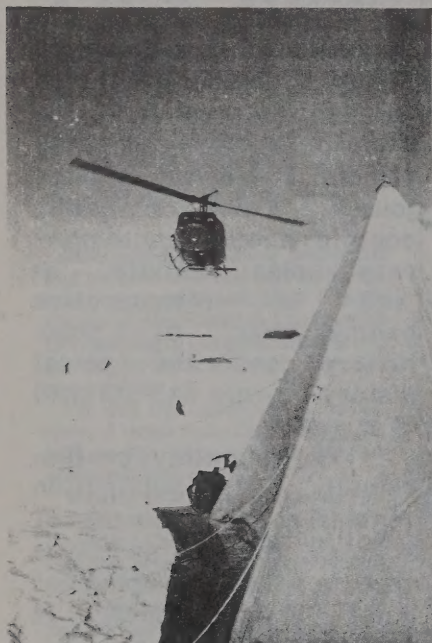
Some of the articles actually contain information that provides the first enlightenment of a certain subject. A number of informational discoveries can be found in its issues.

Subscriptions (Six issues/year) from S. H. Jacobson, Secretary, ASPP, P.O. Box 945, Skokie, IL 60077 (\$12/yr., sample copy \$2.00).



In northern Victoria Land a UH-1N helicopter lands near a Scott tent, one of the tents used by U. S. scientists working in remote areas of Antarctica. The tent is pyramid shaped, stable in high winds, and can be erected quickly.

NSF photo by Russ Kinne.



NSF photo by Russ Kinne.

At field camps in Antarctica, snow caves are constructed to store frozen foods. Above Dennis Miller, an employee of the support contractor ITT Antarctic Services, Inc., checks food supplies at the Dome C field camp during the 1981-1982 austral summer.



NSF photo by Russ Kinne.

Two geologists and a biologist prepare to leave their main camp to collect data in northern Victoria Land. To reach remote areas of the continent, scientists use motor toboggans and sleds for transportation.